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Proposal for Sampling Methods Database: A Hypertext Approach to Hazardous Waste Cleanup

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PROPOSAL FOR SAMPLING METHODS DATABASE

A HYPERTEXT APPROACH TO HAZARDOUS WASTE CLEANUP

by

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3113 Proposal for Sampling Database: A Hypertext Approach to Hazardous Waste Cleanup

This report is part of the National Network for Environmental Management Studies under the auspices of the Office of Cooperative Environmental Management of the U.S. Environmental Protection Agency. The intent of developing a computerized database is that it will facilitate inquiries into hazardous waste cleanup — what equipment to use in the field, and which sampling and analytical methods would be proper given certain environmental conditions. The NNEMS project serves as a proposal on how further research should be conducted on the sampling issue and which computer software package would be best suited for that purpose.

Currently, EPA databases lack sufficient information or the information is too scattered for an individual to find complete answers on questions relating to hazardous waste cleanup. This project defines suitable information to incorporate in a new database. It will include such information as: standards, sampling methods, quality assurance materials, and analytical methods.

The proposed project will be written in KnowledgePro, a program which uses hypertext combined with database capabilities. It is easy to use and simple to program and reads EPA owned ASCII text files, Lotus and dBASE III files. This will enable EPA employees to access pertinent information related to hazardous waste cleanup.

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TABLE OF CONTENTS

I. Executive Summary

II. Proposal Paper

III. Appendix A (Bibliographic References)

IV. Appendix B (List of Personal Contacts)

V. Appendix C (Knowledge Garden Inc. and Jeff VanEe)

Executive Summary

The intent of developing a computerized database is that it will facilitate inquiries into hazardous waste cleanup -- what equipment to use in the field, and which sampling and analytical methods would be proper given certain environmental conditions. This project serves as a proposal on how further research should be conducted on the sampling issue and which computer software package would be best suited for that purpose.

No single reference exists within EPA for people to find complete answers on questions relating to hazardous waste cleanup. Most of the information exists but is so widely scattered throughout publications within the agency that RPM's and other individuals would consume far too much time finding answers to such simple questions as which tool would be proper to use or which analytical method will be used in the laboratory. Others have attempted to develop a database which would contain such information but none held sufficient information.

My role was one of defining the process which would take place in developing a suitable reference method. The first step was defining what information to include in the database. It will include such information as:

I. Standards
II. Sampling Methods
III. Quality Assurance Materials
IV. Analytical Methods

The proposed project will be written with a program which uses hypertext combined with database capabilities. The program is called KnowledgePro. The proof of its applicability to databases is REGIS which was written from an African study conducted by the United Nations. This program was written in less than eight weeks by two people who consider themselves non programmers.

KnowledgePro is best suited for EPA's purposes because it is easy to use and easy to program. It also reads simple ASCII text files, Lotus and dBASE III files. Since these programs are readily available, this presents no additional cost to EPA.

The future project can be conducted in one of two ways -- in-house research and programming. This is less costly but not as professional. However, the program would then belong to EPA. The second method is through a private contractor. This method **might** give more professional results but would be much more costly to EPA.

EPA will greatly benefit from a computerized database which would allow access to any pertinent information related to hazardous waste cleanup.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

PROPOSAL FOR SAMPLING METHODS DATABASE
A HYPERTEXT APPROACH TO HAZARDOUS WASTE CLEANUP

by Doug Peterson
EMSL/ORD-Las Vegas

INTRODUCTION

This paper deals with the subject of standardizing sampling method criteria so that this information may be easily accessible by anyone involved in the cleanup of hazardous waste sites.

As is well known within EPA, there is no one publication or reference an individual may obtain which will give not merely a compendium but a full description of such categories as:

Sampling Methods-Actual Cleanup Methods
Analytical Methods
Quality Assurance Materials
Federal, State, and Local Standards for Analytes

The first reaction to this statement is that such information does exist, which is true. The problem is that the information is scattered throughout too many sources. Any given RPM can consume far too many hours deciding which method is best for a given set of conditions within a waste site. He can also have difficulty deciding which method is most cost effective. There are so many methods and materials available that no one individual can know them all. The significance of this is that the methods being used

may not be the best for a particular waste site.

In the past ten years there have been several attempts to standardize analytical methods. Two of these methods, CLIPS and the more significant LIST OF LISTS attempted to provide a framework within which individuals might have computerized access to needed information pertaining to chemicals. However, a method is needed which goes beyond these -- one which would allow access to any facet of the above-mentioned categories.

Research Project '89

The summer of 1989 served as a research project period (for Doug Peterson) during which time I conducted preliminary research on a standard computerized database.

During this time, I gathered as much information as possible on the availability of information regarding the cleanup process for RPM's and for others in the agency. I was interested in what existed in the way of standard publications, reference material or other resources for individuals' use. I started with the issue of water since this had been researched more thoroughly than either soil or air. I discovered that no standard reference existed with which one could become acquainted with the various issues of sampling and analysis. It became evident that such a standard reference, whether in hard copy or computerized form, would be of immense value to anyone involved in the process of hazardous waste cleanup.

Therefore, my role became one of defining the process which would take place in developing such a reference method. I

identified ways of obtaining the data which would be input into a database.

DATABASE

The following is a description of the information which the proposed database will contain. The database should:

1) Incorporate and display the relationships between standards, appropriate sampling methods, and suitable analytical methods to ensure that appropriate methods are chosen and that their performance characteristics are well defined.

2) Provide readily available information on applicable standards (a class of ARAR's -- Applicable Relevant and Appropriate Requirements), sampling methods, and analytical techniques.

3) Highlight areas where the performance characteristics are unknown or inappropriate and further research or method characterization is required.

4) Indicate the source and availability of materials that may be used to characterize the performance of a sampling method or analytical method.

The is a list of how the information will be researched and input into the database:

I. STANDARDS
Contaminant
Media: Air, Surface water, Groundwater, Soil
Standards: Federal, State and Local

II. SAMPLING METHODS
Contaminant
Media: Air, Surface water, Groundwater, Soil
Methods: Air, Surface water, Groundwater, Soil
Method Characterization:
Reference, Equivalent, or Characterized method?
Manual or Automated?
Sample volume?
Minimum level of contaminant reliably sampled?
Maximum level of contaminant reliable sampled?
Interferences from water or other contaminants?
Bias (as determined under controlled conditions)?
Precision (as determined under controlled conditions)?
Environmental conditions for proper use?

Cost -- per sample and overall?

III. QUALITY ASSURANCE MATERIALS
Contaminant
Media: Air, Surface water, Groundwater, Soil
Reference method, ASTM, EPA Performance Evaluation

Material:
Contaminant range?
Interferences?
Used to calculate: Bias? Precision?

IV. ANALYTICAL METHODS
Identical in criteria to the SAMPLING METHODS section.

The proposed database would be written with a program which can combine elements of an expert system with hypertext. "Hypertext is a computer-based method of organizing blocks of text in which concepts are linked in a hierarchical manner, to be called for display at the user's request."[1] For the novice to computer systems, this means easy to follow pop-up menus which the user can employ for better guidance through the database. The program is easy enough for non-programming people to use for programming purposes.

The proof of the useability and practicality of KnowledgePro is a program called REGIS which was a project performed by the United Nations Aquaculture Development in Africa. REGIS was built in association with the U.S. National Agricultural Library which is a division of the U.S. Department of Agriculture. "REGIS is a system that automates the entire text of a regional sector survey of Africa performed by the United Nations Aquaculture Development and Coordination Programme."[2] The information was summarized in computer form and written in a stunning format by Larry Beilawski

and Robert Lewand of Goucher College in Baltimore, Maryland. These two men do not consider themselves programmers and yet they were able to accomplish this feat in less than eight weeks.

A demonstration of this package is available from Knowledge Garden Inc. or can also be obtained from Jeff VanEe of ORD in Las Vegas, Nevada. Both numbers and addresses can be obtained in Appendix C.

KNOWLEDGEPRO

I selected the software package which would be the most useful to EPA, easiest to program, easiest to use, and most cost-effective. The selected software package will combine the hypertext features with the database. The computer package used by the U.N. and proposed for EPA is KnowledgePro and is sold by Knowledge Garden Inc. As alluded to above, a non programmer can use it to create a very professional looking database system.

KnowledgePro works in this way: it takes very simple commands created through an ASCII text file and saved with a .KB extension. This is considered the source file. This file is automatically compiled into another file with a .CKB extension the first time the file is loaded with KnowledgePro.

Data to be read can be read from Lotus worksheet files or dBASE III files using an add-on program called Database Toolkit. However, it need not be even this complicated. The REGIS program mentioned above was written entirely with ASCII text files. Therefore, armed with simply a text editor, one can create virtually any KnowledgePro database without graphics. Graphics can

be imported (up to EGA resolution) from Lotus Freelance or PC Paintbrush through another toolkit called Graphics Toolkit. The cost breakdown will be given later for the toolkits as well as for the KnowledgePro package.

Another program which can be purchased with KnowledgePro is KnowledgeMaker. This turns KnowledgePro into a true expert system by allowing the user to create rules based on the entered data.

Upgrades

KnowledgePro 1.4 is the current version, while release 2.0 is due in September or October. Knowledge Garden Inc. will need to be contacted in order to get details on the exact differences between the two versions. However, version 2.0 can be obtained for $90.00 as an upgrade if you currently own version 1.4 of KnowledgePro. Knowledge Garden Inc. is also planning on a KnowledgePro Windows which will work in the Microsoft Windows environment. It costs $695.00 but will not serve EPA any better than the other versions.

Knowledge Garden Inc. is also planning to upgrade its toolkits which promise to have more features than the older versions of its toolkits.

COST BREAKDOWN

The cost of the KnowledgePro package is minimal compared to that of conventional computer packages. The cost is as follows:

PRODUCTS REQUIRED	PRICE	SHIPPING & HANDLING
KnowledgePro System	$495	$8

KnowledgePro Runtime	15	no charge
KnowledgeMaker	99	3
Database Toolkit	49	3
Graphics Toolkit	89	3
	$747	$17

That which makes the cost of this package so minimal is the runtime version which is purchased for $15.00 and can be distributed freely as many times as is needed. Once the application database has been created, it can be distributed with the runtime version as many times as is needed within the agency free of charge. This situation assumes the programming was done "in house" or in other words, by EPA personnel hired to conduct the survey and write the program.

The database can easily be written by non programmers using KnowledgePro. If this were the case, the cost to the ten regions within EPA would be very minor. The larger cost would come to the division within EPA which would provide the funds for the research project and the original KnowledgePro package. From that point on, only the cost of the disks would be incurred by the ten regions. If the research and programming were to be given to contractors, the cost would vary greatly and would depend upon the particular contractor.

KnowledgePro can read from Lotus and dBASE III files only which does not present any additional cost because most of the

machines within EPA are equipped with both of these programs. Even better, the entire program could be written with a standard ASCII text editor which is provided through WordPerfect or through DOS's Edlin text editor.

KnowledgePro can be run on any IBM compatible machine with at least 640k. It requires a hard disk, and EGA graphics with a color monitor. A mouse is recommended especially for graphics, but is not required. The mouse is one piece of equipment which might limit the use of KnowledgePro applications within graphics since mouses are not readily available on the computers at EPA. A survey will need to be done to see what kind of computer equipment is available to field operations.

RESEARCH PROCESS

The research process can take one of two avenues. The first is less expensive: in-house research **and** programing. This could be done by awarding fellowships or grants to graduate students in the **technical sciences**. Students involved in graduate soil or water studies could be recruited to begin the research. Once that was completed or even concurrently, other graduate students in the same fields or even computer sciences could perform the programing. The research and programing could even be conducted by graduating students who are looking for a good project to give them experience and a short-term job.

The second alternative is to contract the entire process out to a private contractor such as Lockheed Corporation in Las Vegas, Nevada. This method has the advantage of having trained and

professional personnel who are already on hand and who could accomplish the task in a much shorter time with perhaps more professional results. The other advantage of this alternative is that Lockheed has already written a similar program for EPA entitled ESES-SM. This program was written with KnowledgePro and deals with soil sampling. It would at least be a good start for the entire process since Lockheed would be familiar with KnowledgePro and the methodologies of sampling and QA/QC.

The in-house research would be much cheaper because of the lower salaries of the students. Also once the projects were completed, the program would belong to EPA and could be distributed freely among the ten regions. The contracted research **might** be more professional but would cost much more in salaries. Once the projects were completed, there would be the additional costs of purchasing the final product for each of the ten regions. This cost would depend entirely on the contractor.

CONCLUSION

The project, upon completion, will facilitate the cleanup process for the people involved in the field. Each region will be equipped with a copy of the KnowledgePro application and at a moments notice would be able to answer any question related to the cleanup of hazardous waste sites. Currently, such a reference does not exist -- this is why more research needs to be conducted and applied through KnowledgePro. EPA would greatly benefit from such an application.

ENDNOTES

1.PC WEEK. August 15, 1988. Vol. 5 No. 33. Mickey Williamson.

2.Info World-The PC News Weekly. March 20, 1989. Vol. 11, Issue 12. Scott Mace

APPENDICES

The following pages contain information which will be of value to anyone conducting further research on this project. They contain such pertinent information as lists of personal contacts and other references.

APPENDIX A

BIBLIOGRAPHIC REFERENCES

A complete list of bibliographic references can be found through Jeff VanEe (Appendix C) in a dBASE III Plus program or in a Lotus version 2.01 file format. This list contains all the pertinent information I was able to find on the sampling issue. There is of course much more. This list gives a good start to anyone continuing this research project.

Also, a very comprehensive list of bibliographies and databases (commercial and governmental) is available in a recent document Practical Guide for Assessing and Remediating Contaminated Sites. This document was created in part by Joseph Abe whose information is found in Appendix B. The document can be obtained from him.

APPENDIX B

LIST OF PERSONAL CONTACTS

Ramon A. Olivero, Ph.D. (702) 734-3338
Works for Lockheed in Las Vegas and performed work on the ESES-SM program for EPA.

Bill Telliard (Office of Water, EPA Hqtrs) FTS #382-7131
Worked on List of Lists. Good grasp on water standards and computer systems.

Carla Dempsey (Superfund, EPA Hqtrs) FTS # 382-5746
Works with the analytical branch.

Mickey Cline FTS # 629-1190
Works with the committee who is in charge of approving software for EPA.

Fred Haeberer (QUAMS, EPA Hqtrs) FTS # 382-5785
Has a good hold on QA/QC material and somewhat on computer systems.

Dean Neptune (QUAMS, EPA Hqtrs) FTS # 475-9464
Works with QA/QC projects. Has worked on other sampling projects.

Stanley Blacker (QUAMS, EPA Hqtrs) FTS # 382-5763
Works with Dean Neptune on QA/QC projects.

Joseph M. Abe (EPA Hqtrs) FTS # 475-7371
Joseph put together the publication which lists EPA bibliographies and other commercial and governmental databases.

Ron Hoffer (EPA Hqtrs) FTS # 382-7077
Ground Water Guidelines.

Office of Drinking Water
Science and Technology Division FTS # 382-3022
Health Effects Division FTS # 382-7571

Joe Cotruvo (EPA Hqtrs) FTS # 382-7575
Criteria and Standards

William R. Diamond (EPA Hqtrs) FTS # 475-7301
Water Regulations and Standards

Jane Denne (EPA Las Vegas) FTS # 545-2655
The best possible source on sampling methods for groundwater.

Paul Marsden (EPA Las Vegas) FTS # 545-2206
QA/QC Material

Larry Butler (EPA Las Vegas) FTS # 545-2114
QA/QC Material

Ken Brown (EPA Las Vegas) FTS # 545-2214

Vernon Myers (EPA Hqtrs) FTS # 382-4660
Groundwater

Joan Fisk (EPA Hqtrs) FTS # 382-3115
Superfund

American Petroleum Institute (202) 682-8000
Information contained in database which Jeff VanEe has.

U.S. Geological Survey (703) 648-4000

APPENDIX C

Knowledge Garden Inc.

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